Standard Operating Procedure For Total Dissolved Solids (Total Filterable Residue)

1.0 Location

Total dissolved solids determinations are performed in the Spectroscopy Lab, Room 305.

2.0 Purpose

The purpose of this method is to determine the amount of dissolved (filterable) solids contained in an aqueous sample. Filterable residues are those solids capable of passing through a glass fiber filter and dried to constant weight at 180° C

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3.0 Scope

3.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes.

3.2 A well-mixed sample is filtered through a standard glass fiber filter, and the filtrate is evaporated to dryness in a weighed dish and dried to constant weight at 180° C. The increase in dish weight represents the total dissolved solids.

4.0 Reference

4.1 Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020), March 1983, Method 160.1

4.2 Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, Method 2540 C.

5.0 Sample Handling and Preservation

5.1 No preservatives are used. Analysis should begin as soon as possible. Samples should be refrigerated or iced to 4° C to minimize microbiological decomposition of solids. Samples are stored in the walk-in cooler in the garage.

5.2 The holding time is seven days.

6.0 Apparatus and Materials

6.1 Gooch crucibles

6.2 Whatman 934-AH, 2.1 cm glass fiber filter disks (1.5μm)

6.3 Clean suction flasks with Gooch adapters, connected to sink faucets

6.4 Drying ovens, 103-105°C and 180° C ±2°C.

6.5 A desiccator, with desiccant that indicates moisture with a color change. Make sure desiccant is dry and blue color. Change at least monthly or as needed.

6.6 Analytical balance, capable of weighing to 0.1 mg.

6.7 Graduated cylinders

6.8 Wide mouth pipet

6.9 Flasks or beakers, 200 ml.

6.10 Forceps

7.0 Procedure

7.1 Preparation of glass fiber filter disk

7.1.1 Using forceps, place a filter disk on the bottom of a Gooch crucible with smooth side down and the orange peel side up.

7.1.2 Apply vacuum to suction flask, place a Gooch on the suction flask. Rinse the disk with three successive 20 ml volumes of deionized water. Continue the suction to remove all traces of water from the disk, about 3 minutes after all liquid passes through. Discard washings.

7.2 Preparation of drying flasks

7.2.1 Place clean flasks in 105° C oven for at least two hours. Then place in 180° C oven for one hour.

7.2.2 Remove and place in a desiccator for at least one hour.

7.2.3 Weigh flasks immediately to nearest 0.1 mg. Record weight and identifying number on worksheet.

7.3 Sample analysis

7.3.1 Assemble filtering apparatus with a clean, dry filter flask and begin

suction by turning on water.

7.3.2 Place prepared Gooch on apparatus and wet filter with deionized water.

7.3.3 Before beginning analysis, the sample should be warmed to room temperature by placing in a pan of hot water. Shake the sample vigorously for at least 20 seconds. Without delay quickly pipet a measured volume (usually 100 ml) into Gooch in filter apparatus. Filter until all liquid passes through. Record amount filtered on worksheet.

7.3.4 With suction on, rinse with three, 10 ml portions of deionized water. Allow complete drainage between each rinse. Apply suction for 3 minutes after last rinse. These rinses are important to remove any dissolved solids which may become trapped on the filter or residue.

7.3.5 Pour entire contents of filter flask into a clean, weighed flask.

7.3.6 Dry flasks in 105° C oven until dry, usually overnight.

7.3.7 Place in 180° C oven for one hour. Record temperature of oven on work sheet.

7.3.8 Remove flasks and place in desiccator for one hour. Weigh to the nearest 0.1 mg immediately. Record weight on work sheet.

7.3.9 Analyze each sample in duplicate. Chain of custody (W) samples are done in triplicate.

8.0 Quality Control

8.1 All samples are done in duplicate except chain of custody samples are done in triplicate.

8.2 Duplicates must be within 15% except for very low levels. Any sample with differences above 15% must be rerun.

9.0 Data Analysis

9.1 Calculate total dissolved solids as follows:

$$\text{TDS, mg/l} = \frac{(A - B) \times 1000 \times 1000}{C}$$

where:

A = weight of flask and residue, in g
B = weight of flask, in g
C = ml of sample filtered

9.2 Choose sample volume to yield between 10 and 200 mg dried residue. When very low total dissolved solids are encountered (less than 10 mg/L) compensate by using a high-sensitivity balance (0.002 mg) or add more filtered sample and redry.

10.0 Interferences

10.1 Highly mineralized waters containing significant concentrations of calcium, magnesium, chloride and/or sulfate may be hygroscopic and will require prolonged drying, desiccation and rapid weighing.

10.2 Samples containing high concentrations of bicarbonate will require careful and possibly prolonged drying at 180° C to insure that all the bicarbonate is converted to carbonate.

10.3 Too much residue in the evaporating flask will crust over and entrap water that will not be driven off during drying. Total residue should be limited to about 200 mg.

11.0 Documentation

11.1 Record all data on worksheet.
11.2 Record flask number and weight before and after filtering and drying sample.

11.3 Record log number and amount of sample filtered.

11.4 Record temperature of oven and time flasks put in.

12.0 Records

TDS worksheets are stored in the TSS book in the BOD area in Room 305.